

## The truth about a bird's eye view

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### Reviewed by:



**Henry**  
12 years old

Have you ever wondered what it would be like to see through the eyes of a bird? What about a fly? Or your dog? Scientists who study animal eyes can find out what it would be like to see the world from an animal's perspective by studying their behavior, as well as the shapes and sizes of their eyes. In addition, they can study the inner parts of the eye, such as the lens, which focuses light, or the different types of cells that make up the eye. For example, rod and cone cells are special cells in the back of the eye that detect light and send the message that it is light out to the brain.

Here are some things scientists have learned from studying animals' eyes – including some things you might not have imagined.

**Fact or fiction?: A fly sees hundreds of images of the same thing with its eyes.**

**Fiction!**

Flies have eyes that are very different from ours. Their eyes are called “compound eyes” because each eye is actually hundreds of little eyes compounded together. Each little eye has its own lens, rods, and cones, and transmits a unique signal to the fly's brain.

Though you may have heard differently, even though flies have compound eyes, they still see one image, just like us. This is because each little eye in the compound eye is pointed in a slightly different direction, so the light it senses is separate from the other little eyes.

The way a fly sees is similar to how a picture is formed on a computer (See Figure 1). If you think of a picture on a computer, it is composed of many pixels that are in different places. Like the pixels in a picture on a computer, the information from

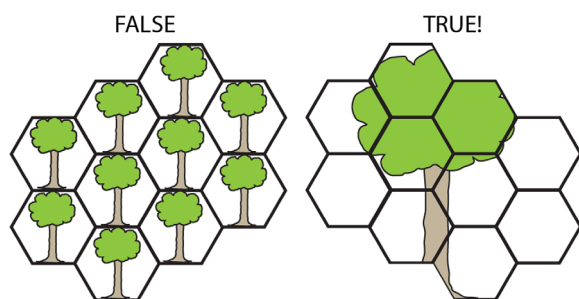


FIGURE 1 - The view of a tree from the compound eyes of a fly. Hexagons represent the individual little eyes.

the different little eyes gets put together to form an image. In this case, the fly's brain puts all the information from the little eyes together to make one image of what the fly sees.

**Fact or fiction?: A dog can see me when it's licking my face.**  
**It depends!**



FIGURE 2 - Dogs have different eyes depending on the breed of the dog.

Small dogs are usually good at seeing things up close and can probably make out smiles and frowns on our faces (See Figure 2). This is because small dogs were bred to be human companions and live inside. Those small dogs that were good at interacting with humans, probably because they could see their faces better, were more likely to be bred to make puppies [1].

In contrast, large dogs are good at seeing far away, but aren't very good at seeing up close. These dogs were bred to do work outside, like hunting birds and rabbits or herding sheep. Breeders picked the dogs that were best at doing their work and over time most large dogs evolved longer distance vision. To do this they sacrificed being able to see very well close up.

So why do big dogs come close up to greet you if they can see you better from far away? Dogs have a really great sense of smell and they approach humans in order to smell them.

**Fact or fiction?: There are animals that can see more colors than a person.**

**Fact!**

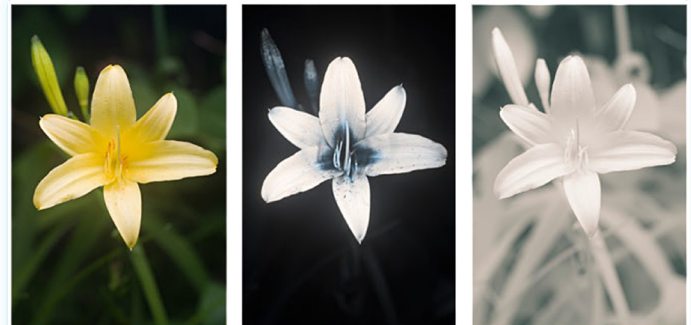


FIGURE 3 - What a flower looks like to us and to a bee [2].

Humans can only see three colors: red, green and blue. All of the other colors we see are because of the combination of red, green, and blue light, similar to how you can create an orange painting with yellow and red paint. On the other hand, birds can detect four different colors with their eyes. In addition to seeing red, green, and blue, birds have a special type of cone cell that is activated when ultraviolet light shines on it.

Ultraviolet light, or UV light, is the light that comes out of a black light. More powerful versions of this type of light can give you a sunburn if you are at the beach without sunscreen.

Birds see ultraviolet light because it is important for mating and for finding their prey. Many birds have colorful patterns of feathers that reflect UV light to attract their mates. When the UV light reflects off their feathers, other birds that can see UV will see the reflections. Small prey also often leave trails of urine that reflect UV light. Birds can use their UV vision to track their prey when hunting [3].

Because we do not have receptors for UV light, we cannot see these patterns. However, other animals besides birds can also see UV light, like bees and fish. Many flowers reflect UV light in exciting patterns to attract bees so they will be pollinated (See Figure 3).

**Fact or fiction?: Some animals can see even in the dark.**

**Fiction!**



FIGURE 4 - Badgers are nocturnal animals.

Owls, raccoons, and badgers are nocturnal because they are awake at night. Although it may seem like nocturnal animals are able to see in the dark, these animals would not be able to see at all, if it were completely dark.

Because vision is based upon light, without it there would be nothing to activate the rod and cone cells in the eye, so the animal would only see black. However, nocturnal animals are able to see in very dim light because they have special types of eyes.

One important part of being nocturnal is having bigger eyes. The bigger the eye, the more light can get in. Therefore there's a higher chance of collecting light, and thus being able to see at night. A human's eye "gets bigger" in the dark too. When you go into a dark room your pupils will get bigger to let more light in. If you then hold up a mirror and turn on the light, you'll see your pupils shrink.

Nocturnal animals' eyes are also special because they have more rod cells. Rod cells are a type of cell that is better at sensing very small amounts of light. If you have more rods, you can see much better in dim light. Humans have rods too, but not as many as nocturnal animals do.

The final specialty for nocturnal animals is a reflective material in the back of their eyes that is like a mirror. You may have come across a dog or cat at night and seen light reflecting out of its eyes (See Figure 4). In the same way that having big eyes helps an animal see in the dark, the mirror lets the eye collect more light by giving the rod and cone cells two chances to see the light, once when it passes into the eye and once more when it reflects off the mirror and comes back out.

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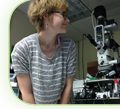
## REVIEWED BY:



Henry, 12 years old

I am in 7th grade, and my parents are neuroscientists. I like to play sports, especially basketball. My favorite TV show is the Simpsons. When I grow up, I want to be an engineer and invent cool and important things.

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Is a neurobiologist in California. Anna's favorite dinosaur is Archaeopteryx. She likes the Harry Potter books and thinks science is a lot like magic.



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